844
826

speeded up with heat to the point of blasts. The strength of the contractions of labor was in direct proportion to the speed of the winds' circulation. The great pushes of the expulsive lom beng "broke down" the sac with the amniotic fluid (nam thun hua: water-that-supports-the-head-of-the-child), and forced out the child, water, and the placenta.

After the child was out, the mother was cold, weak, and exhausted. Her uterus was full of harmful fluids. Heat was needed more than ever not only to warm her but to give the winds "the power and push" to drive out three undesirable birth-waters: "The blood that looks like ordinary blood but is bad,"; the amniotic and abdominal body water (nam khram:refuse water); and the pale, viscous, repugnant "fish-water" (nam khao plā). Therefore, a hot fire was built, close to which the mother lay (yu fai), turning all sides of her body towards the flame. She bathed in or drank hot or warm boiled water (nam suk: cooked, or ripe, water). She ate safe foods like rice and dried fish,[1] and kluai nam bananas, continued to take alcoholic medicines of the hottest sort, such as Snake Brand, and occasionally might be given cobra or other hot curries to eat. For a first-born, a woman stayed eleven or nine days by the fire (always an odd number), with stays shorter for each successive child, but never less than five days.

844
[372]
[262]
846

Complications sometimes developed because of inadequate control of the heat. A "headache and a hot body" indicating "stagnation of the blood and the fishy-smelling-water," was cured by a heat-producing decoction. Rashes often occurred, causing small boils that might develop into sores. To soothe these, turmeric was painted on. In the most dangerous cases the heat "drove the bad blood to the heart, to the face or belly" where it was recognized by serious swelling, with resulting madness or death. In fact, one mō felt that the

846
858
278
822
[164]

---

31. The reasons for rejecting fresh fish during pregnancy ("lest a creature of hell be born") would not hold after parturition. Yet fresh fish was rejected then too "as bad for the womb." One suspects that the less odorous dried fish was substituted so that the odor of fresh fish, like air-borne, incompatible food, would not affect adversely the "fish-smelling" post-partum discharge (nam khao plā). In Hauck's list of foods "bad for mother during the post-partum rest," the reasons are apparent: Sour tastes did not dry out the body, but built up water; egg was too cooling; jackfruit brought in wind; glutinous rice and the sugar of sweets "wet the uterus;" fruits did not give strength and were excessively cooling (cf. Hauck,1959:18).

262
843
846

Chapter VII

ATTITUDES TOWARD MODERN MEDICINE AND MIDWIFERY

753
178

Modern and traditional medicine appeared to Bang Chan to have much in common. Both subscribed to a belief in disruptive intrusions. In typhoid and cholera, the old scheme postulated intrusions of fire and earth. Boils involved a spirit attack or excess of fire. For these same disorders, new medicine spoke instead of virus or bacterial infection. Such concepts as nutritional deficiencies, insect transmission, and pollution, however, were alien to the old views as disease agents.

757
178

Modern medicines paralleled the old decoctions. Antibiotics, ointments, or pain-pills were appreciated for their efficacy, but evoked no surprise, for every plant in the world was said to have some therapeutic value. Injections were similar to the sub-cutaneous medical protective needle. [755]

75
178

"Old" medicine did not feel threatened because people were not convinced that the modern was better. The 2 systems were viewed as different, each having its own specialties. The difference was sometimes phrased as "Old medicine cares for old ailments, modern medicine for new ones." Spirit possession and khun attack, for instance, were old ailments; poliomyelitis, gonorrhea, and maybe diphtheria, new (J.R. Hanks, 1955:185-191). It was sometimes better not to claim competence outside these customary lines. One man said he could cure gonorrhea, but the young men preferred a city doctor. Sometimes, though, one could not be sure what was a new disease. [164]

75
829
178

Another phrasing of the proper place for modern medicine was that because of varying "habit," differing social stations required differing medical techniques. "Modern medicine is only good for delicate city people or other kinds of farmers, but does not give enough strength for rice-farmers." The orchardists below Bangkok who "had the habit of eating a lot of fruit," and the teachers and traders of Bang Chan (who went to the second class practitioners, and occasionally to modern doctors) were assumed to have different physical needs than farmers. The post-partum fire was clung to as strength-making: "woman are weak if no fire." The hot ashes chamber, introduced from Bangkok, was for the most part used by non-farm women.

377
758
802
178
184

Average intakes of riboflavin were estimated to be about a third, or less, of the allowances. Estimates of calcium intake were, on the average, only 20% of the allowance for Group A, and 30% of that for Group B. Although the calcium allowances were thought to be conservative, estimated requirements based on calcium balance experiments are believed by some investigators to reflect usual intake rather than need, and the extent to which man may adapt to a low calcium diet is still undetermined. Among residents of Bang Chan, no evidence was noted other than short stature and small bones, which might suggest a calcium deficiency.

The vitamin A value of diets of both Groups A and B appeared to be low. Clinical signs possibly associated with vitamin A deficiency, i.e. xerosis and phrynoderma, occurred among residents of Bang Chan (Hauck, 1956), and as would be expected from the method of selection of the two groups, such skin signs were more prominent among members of Group A than Group B. On this basis one would expect the vitamin A intake of Group A to be less than that of Group B, whereas the reverse appeared to be the case on the survey days; but the higher estimated vitamin A value for the diets of Group A than Group B may not represent a real and consistent difference. The yellow (2)sa-(5)nd flowers, for which no nutrient values were found, were used rather liberally by some families in Group B at one season and may have contributed vitamin A value. Moreover, owing to unavoidable changes in the plan for alternating visits to the two groups of families, those in Group B were visited more often when the level of water in the canals was low and the leafy water plants were not available. The unusual intake of a large amount of yellow sweet potato by one family in Group A on one survey day may also have tended to distort the picture. Families in Group A, however, used substantial amounts of sweet basil leaves, whereas in Group B, this herb was used for seasoning only.

The estimated amount of thiamine available per capita, before cooking, was 73% of the estimated allowance for Group A and 79% for Group B. Since over four-fifths of the thiamine content of the foods used by each group came from rice, and the thiamine loss when rice is cooked as it was in Bang Chan has been estimated as 75% or more (Thangraksatve and Srisukh, 1955) the actual per capita intake of thiamine must have been below the value of 0.23 mg. per 1000 calories which the Food and Nutrition Board, National Research Council (1953) considered to be the minimal requirement for adults. According to Nicholls (1951, p. 87), a ratio of Thiamine: Non-fat Calories of 0.3 - 0.35 is borderline and too low, and ratios below 0.3 are associated with beriberi-producing diets. That the diets of some of these people, as eaten, were in fact dangerously low in thiamine, is attested by the occurrence of beriberi and history of beriberi among them. Of the 15 persons, 20 years of age or older in Group A, 7 had knee jerk

146 absent, and in 6 of these, ankle jerk was absent also. In
• 164 Group B, the apparently better nourished group, one adult and two school boys had knee jerk only absent. In Group A, Household 12, the father, mother and 21 year old son all had both knee jerk and ankle jerk absent. The son was diagnosed by the examining physician as having frank beriberi at the time of the medical inspection. In Household 2, the father and 23 year old son had both knee jerk and ankle jerk absent, but the mother had no signs of thiamine deficiency. In Household 67, mother and father had both knee jerk and ankle jerk absent. The mother had lost 3 of her 6 children when they were 3 or 4 months old, with symptoms such as convulsions and voiceless crying, suggestive of infantile beriberi. When the third child died, the mother had symptoms of beriberi, and the physician who conducted the medical inspection considered the death of this child to be due to infantile beriberi. Clearly the thiamine content of diets of some of the families studied was inadequate to meet their needs under varying conditions of activity and stress. Beriberi was the one frank deficiency disease observed while these studies were underway in Bang Chan (Hauck, 1950).

146 Fat provided only about 9 to 10% of the calories. Coconut oil contains only about 0.5% of linoleic acid (Anantakrishnan, et al., 1949), but the essential fatty acid content of the diet as a whole was not estimated.

146 In summary, although the estimated nutrient intakes of
164 Group B were in general more favorable than those of Group A, the contrast between the two groups was not striking. Perhaps we should have anticipated this from the fact that the groups did not present a clear contrast in apparent nutriture. In Group A, 19 of the 30 persons examined had a total of 36 possible signs of nutritional deficiency. In Group B, 8 persons had a total of 9 such signs. Judging by both the apparent nutriture of the household members, and by their estimated nutrient intakes, the diets of both groups were in need of improvement.

146 Contribution of Food Groups and Certain Common Foods to the Nutritive Values of the Diets

[illegible] Contribution of Food Groups and Individual Foods. - The percentages of the total calorie and nutrient intakes provided by various food groups for households in Group A and B are shown in Table 12.

146 Rice and other cereals. - Rice was the staple food,
262 which provided over 4/5 of the calorie intake and more than half of the protein for both groups. Much of the difference in calorie and protein intake of the two groups was due to the greater rice consumption of Group B. Rice was also the

[Text continues on page 72 --- Analyst]

[196] [282] higher caloric intake in these periods. In general, the level of calories, phosphorus and thiamine and to some extent the protein varied with the rice consumption. The greater consumption of fish when fish ponds were drained during Round IV, accounted for the relatively higher protein content of the diets of both groups at this time, even though caloric intake was not at its peak. During this period, animal foods provided 45 and 53% of the total protein intake of Groups A and B respectively, whereas for the year as a whole, 37 and 40% of the protein intake of these groups was of animal origin.

The relatively high vitamin A and C intakes of families in Group A, during Round I as compared to other periods, was associated with a higher consumption of green leafy vegetables, and the use of sweet potatoes in quantity by one family. During Round II, families in Group A had few green vegetables, and their average intake of vitamin A was very low. The use of papaya, obtained as a gift, by one family in Group B during Round II raised the average ascorbic acid intake for this group substantially. Better average intakes, by one or both groups, of vitamin A, thiamine, riboflavin and calcium during the first Round, were not such as to provide liberal body stores to be called upon when food supplies of these nutrients were low.

000

SOME RECOMMENDATIONS FOR IMPROVEMENT OF DIET AND NUTRITURE AMONG RESIDENTS OF BANG CHAN

[166] Attempts to improve nutritional status in Bang Chan should be directed both toward increasing the supply and intake of certain nutrients and toward improvement of sanitary conditions so that intestinal infestation, diarrhea and other related illnesses will not lead to needless loss or increased requirement of nutrients.

Solution of the related problems of disposal of human excreta and provision of a year-round safe water supply are in the province of the sanitary engineer. Intestinal parasitism [164] [312] was common, but little can be done through treatment of individuals so long as the water supply is contaminated. [271] Rain water was preferred for drinking, so provision of adequate and sanitary storage for rain water, coupled with sterilization of water from ponds and canals when rain water is not available, would do much to ensure safe drinking water. [846] [253] The custom of giving mother and infant boiled water only, during the post-partum rest period, provides a starting point for extending use of boiled water to other ages and conditions.

Growing other kinds of green and yellow vegetables should be fostered. Although vitamin A value and riboflavin content appear to be critical, in choosing vegetables to be stressed, specialists in agriculture should consider greens with high calcium and low oxalic acid content also. A variety of edible leaves of trees were used by a few families; some used sweet basil as a vegetable rather than just a seasoning; pumpkin and sweet potato were familiar, but less often used than would be desirable. More green or yellow vegetables which mature when canals are low and aquatic plants no longer available, would be especially good. If increased production by most households[1] is not practicable, a few of the more successful gardeners might be persuaded to produce vegetables and fruits which would help to bridge the gap between rainy seasons. Mushrooms, which can be grown readily, would provide a good source of riboflavin when leafy vegetables are in short supply. The boom-and-bust experience in mushroom culture (See Appendix A, pp. 101-102) might, however, make its revival as a source of healthful food for home use more difficult than if the villagers did not think of mushrooms as a cash crop for which the market failed.

Eating more fruit would help to tide over the dry season. Fruits were commonly used as snacks, not at mealtime, hence snacks of fruit should be encouraged for adults as well as children. Bananas grew in all gardens and were available the year round. The (4)nam (4)waa variety, which was used in ceremonies, and considered safe for all, should be stressed. More families could grow pineapple, which is relished both raw and in curries. Mango and papaya, fruits of outstanding value for both vitamin A and ascorbic acid, would be excellent, but the idea that growing papayas is "unlucky" must be taken into account. If a few of the more thoughtful and forward-looking farmers could be persuaded to start papaya trees, even though they were not willing to plant them near the house, the practice might spread in time.

On the average, the Bang Chan diet did not seem to be very deficient in protein, but distribution is not proportional to need, and protein deficiency may be in part responsible for periods of weight loss, or failure to gain, so common among infants and children. The presence of other essential nutrients in animal foods is important also. If, the local supply of fish is indeed diminishing, efforts to increase it through pond culture should be continued. Abandonment of tilapia culture in Bang Chan, after about one-third of the families had tried it, (Appendix A, p. 101) suggests that not enough of the right kind of help was given

1. Tenant farmers may not be permitted to enlarge gardens by mounding at the expense of rice fields.

SUMMARY

Information on health, care, and diet of mothers and small children in Bang Chan, Thailand, was obtained primarily by interview, although some direct observations were made. In general, three areas of inquiry were included in this study: 1) clinical history, especially such information as might have a bearing on the nutrition and health of the child, 2) food intake at various periods, and 3) cultural customs and ideas of interest in relation to the Cornell Thailand Project.

In all, 66 mothers of young children were interviewed. Information on diet during pregnancy, postpartum, and lactation was obtained from women who were either in the stage under discussion or had only recently passed through it.

The description of child feeding practices is based on records obtained concerning 57 children from birth to two years of age, a majority of whom were visited from 5 to 7 times.

Information on growth in height and weight is based on observations made on 71 children, most of whom were weighed and measured 6 or 7 times. Observations were made for 30 of these children both before and after weaning.

During pregnancy most women in Bang Chan continued to eat as usual. A few expressed cravings for certain foods, and a minority thought some kinds of food should not be eaten during pregnancy.

During the postpartum rest period most women ate a very restricted diet. Rice and fish, with salt, were the foods considered by all informants to be appropriate for this period.

As a rule, diet during lactation, after the mother resumed her usual work, was the customary family diet. A minority of informants mentioned foods which should not be eaten by a nursing mother.

Evidence of the need to improve diets in this region was provided by the occasional occurrence of beriberi or the history of beriberi among mothers as well as by medical inspection and family dietary studies.

Breast feeding was the rule in Bang Chan. For a majority of infants observed, breast feeding was continued into the second year, and some were breast fed for more than two years. Few received animal milk after weaning.

124 Information on growth in height and weight is based on observa-
125 tions of 71 children, most of whom were weighed and measured 6 or 7 times. For 30 of these children, observations were made both before and after weaning.

HEALTH AND GENERAL CARE OF MOTHERS

145 Information obtained on menstrual history of girls and women in Bang Chan has been reported previously (Hauck, 1956). The median and modal reported age at menarche was 15 years with a range from 13 to 19 years.

161 Most married women in Bang Chan had children, and of 438 pregnancies reported by 84 mothers, over 90 per cent resulted in live births (Hauck, 1956).

843 Clinical History and Complaints During Pregnancy.

• 164 Most of the women interviewed reported no history of disease which might affect, or be affected by, nutritional status.

Four women had a history of beriberi; 3, a history of malaria; and one had active tuberculosis of which she later died. In relation to the current pregnancy, 6 women had minor complaints such as nausea in early pregnancy, faintness, and leg cramps. The physician considered these as probably physiological. Of the 4 women with more serious complaints, one who said she had pain in the abdomen and legs and difficulty in walking had manifest beriberi when seen a few days after delivery.

844 Delivery and Care of Mothers After Childbirth.

846 Information was obtained from 49 mothers concerning
125 delivery and care after childbirth. For 43 of these women, ages reported were as follows:

Reported Age (years)	Number of Mothers
20 or under	7
21-25	11
26-30	12
31-35	6
36-40	6
over 41	1

The mothers interviewed had borne from 1 to 12 children. For 8 of them, this was the first child; but 25, a majority,

853 fish and vegetables, when asked if they did anything to stimulate milk secretion. Other preparations, each mentioned once or twice, were cobra curry, fried (3)kuj (1)chaaj flower, pork soup with (3)kuj (1)chaaj leaves, dried peas and peppers cooked in palm sugar syrup. Some of the medications used were reputed to stimulate milk flow. Three women spoke of peacock brand medicine and one of a Chinese medicine in this connection. With respect to the Chinese medicine, another informant said she took it "to remove the serum which interferes with milk secretion." One midwife put herbs on her daughter's breast and expressed and discarded the "early milk" which was considered bad for the baby. No association appeared to be made between putting the baby to the breast and stimulation of milk flow.

Drinking water. - Information concerning sources of drinking 312 water used by the mothers was obtained from 46 mothers of young babies. Of these, 20 used canal water, 23 rain water, and 3 used either one. In general, there was a relation between season and source of water used. Most of the mothers whose babies were born between March and October drank rain water, whereas from November to February a majority drank canal water. Some families had enough water jars to preserve rain water for much of the dry season, whereas others had few or no jars and, therefore, could save only small amounts of rain water on a day-to-day basis. In all instances, the water, whatever its source, was boiled for the mother during the postpartum rest period. Forty-six women said they drank the water hot; one said it was warm. One popular traditional midwife said, however, that if the mother had her baby in the hospital, use of boiled water for drinking and bathing was not necessary.

CONDITION AND CARE OF BABIES AT BIRTH AND IN EARLY INFANCY

125 All information to be reported concerning condition and care of babies at birth and in early infancy relates to infants who were under one year of age when first visited. Thirty infants were seen when they were under 3 months of age.

Condition at Birth.

164 The condition of the baby at birth was generally described
165 as satisfactory. One infant who died on the third day, before we saw the mother, was said to have cyanosis, failed to cry at birth, and needed to be "helped" for about one-half hour afterward. Three infants had congenital defects: umbilical hernia, inguinal hernia on the right side, and hemangioma on the right groin.

One infant had congenital stridor when seen by the physician[1] at 3 months, but the difficulty in breathing had disappeared spontaneously before the baby was next visited at 3 1/2 months of age.

Illness in Early Infancy.

One infant that died on the fifth day was seen when one day old, at which time neither mother nor physician made any adverse comment on its condition. The mother, who was not living with her husband, returned to her work outside the village a week after delivery, and we were unable to talk with her again. So far as we could learn from neighbors, this infant had none of the symptoms concerning which we routinely inquired; namely, convulsions, vomiting, diarrhea, or fever.

A third infant in this series died when he was nearly 2 months old. At 13 days of age, when first seen, this infant had white patches on his tongue which were diagnosed as moniliasis. When the physician saw the child again at 6 weeks of age he made no adverse comments on its condition. Emotional reaction to the infant's death was such that we were unable to get a clear description of events which led up to it from either parents or neighbors.[2]

Three infants had skin infections when seen within a few days after birth. The physician commented that skin was more susceptible to infection when moist than dry and that the babies had become very warm. The weather was hot, and babies were bundled up and/or were near the fire. He gave directions for keeping the skin clean and dusting with sulfa powder.

No deaths from tetanus occurred in this series, although infantile tetanus was prominent among causes of death of infants under one month old (Hauck, 1956).

Medicine Given to Babies During the First Few Days of Life.

On this point, information was obtained concerning 36 of 40 babies seen before they were 6 months old. Thirty of these were given medicine, sometimes more than one kind. Most of the

---

1. A physician was present at all interviews with pregnant women and mothers with very young infants.

2. Although the mother had children by a previous marriage, this was the first child of this union, born after the parents had lived together for 9 years. The mother was 41 years old.

Exposure of Infants to Sunlight.

854 Even during the rainy season sunshine was usually abundant in Bang Chan, but taking a baby out of doors at an early age was generally thought to involve some risk. Many houses had low or wide eaves, and an infant was usually kept in a cradle in the house where sunlight could not penetrate. When old enough to hold up its head while sitting astride an older person's hip, the infant might be carried about the compound by parents or older siblings. As the question was worded ("When did you take the baby outside the house?" or "At what age did you take the baby with you when you went out for pleasure?") the answer did not mean that the baby was taken out with any degree of regularity at the specified age. Most of the babies in this series had been taken outdoors by the time they were 3 months old, but 4 were a year or older when first exposed to [144] sunshine. Nevertheless, the physician found no evidence of rickets among the infants he examined.

One informant, a school teacher's wife, said she thought that taking the baby into the sunshine was not harmful; in fact she believed it made the baby stronger than usual. She thought, however, that too much exposure to sunshine might "bring cold into the baby" and she spoke of the beret as a protection against this.[1] In Bang Chan, as otherwise naked infant might wear a beret when being taken out of doors.

MATERNAL DIET

Diet During Pregnancy.

843 242 [125] Of 31 mothers who furnished some information on diet during pregnancy, 17 were pregnant when interviewed, and the remainder had young infants, in most cases under 3 months of age. Eighteen of the interviews were based on schedule 4 (Appendix p. 83) and provided fairly detailed information on the kinds of foods eaten. Other informants gave more general information, such as foods craved or disliked.

---

[171] 1. Wellin (1956) mentioned the small woolen cap made or bought by mothers in the Valley of Ica, Peru, for the infant to wear. The cap was put on soon after birth and was worn, off and on, for many months. The function of the cap was to prevent the entrance of cold via the fontanel, which was defined as a particularly vulnerable point of entry. Wellin noted that all infants he saw in maternity wards in the Valley of Ica wore woolen caps.

In some age groups fairly large numbers of children were observed and in other groups relatively few. Most of the groups up to 4 1/2 years of age with whom the children in this series could be compared included fewer than 30 individuals. The numbers of boys and girls measured at each age were about the same.

Dr. Amara Chandrapanond (1957) reported the mean heights and weights of 20 babies who were weighed and measured at monthly intervals over a period of a year. She did not report values for boys and girls separately, but, in general, at each age these fell between those for males and females as reported by Dr. Mostri (1939).

In figure 1[1] the median heights of boys and girls in Bang Chan together with the number of individuals who were measured at 3, 6, 9, 12, 15, 18, or 21 months are shown in comparison to the height curves constructed from values reported by Dr. Mostri (1939). Corresponding median weights are shown in figure 2.[2] Although the groups are small, the tendency for both height and weight of young children in Bang Chan to be below that of children attending a well baby clinic in Bangkok is clear.

One should note, however, that Dr. Mostri characterized the children he observed as "free from disease", whereas some of the children of Bang Chan had colds, skin infections, or other minor disorders which might have affected their weights. Such disorders are very common, and we do not know whether or not they disqualified children attending the Well Baby Clinic from inclusion in the series for which heights and weights were reported.

Graphs of height-age and weight-age were plotted for each child in this study and for small groups of children who were observed regularly over a year or so at the same ages.

Most of the children increased in height in a fairly regular fashion, the slopes of their height curves being about the same as the curve drawn from Dr. Mostri's[1] values, although there were individual variations in this. The height curves of many more children of Bang Chan were below than were above the curve drawn to Dr. Mostri's values. Of the 36 girls measured, the height curves of 6 were above, 6 were about the same as, and 23 were below the curve drawn to Dr. Mostri's values for girls. Of the 36 boys measured, the height curves of 9 were

---

1. Mean values reported by Dr. Mostri were plotted at 1-month intervals for the first 11 months, then at the midpoint of the intervals he reported. For example, measurements reported for children 1 to 1 1/2 years of age were plotted at 1 year 3 months.

FIGURE CONTINUED ON PAGE 40 b.

4 [see p. 39 - Analysis; 2 [see p. 40 - Analysis]

about the same as the 3rd percentile of male infants in the U.S.A., and from one year on the values fell below the 3rd percentile. Norms for American children are inappropriate for use with Thai, but an increasing lag in growth such as we observed may be a matter for concern.

Weight Loss and Failure to Gain. - Many of the children in Bang Chan failed to gain or actually lost weight over periods of time. This occurred frequently between two weighings which were 1 to 4 months apart and occasionally when a child was reweighed after an interval of 6 months. In some children loss of weight or failure to gain extended over two weighing intervals. Such loss or failure to gain may be an important sign of malnutrition (Jelliffe, 1955).

Relation to age. - The ages at which the children experienced weight loss or failure to gain were determined by inspection of the weight-age graphs. As shown in Table 17, a period of loss of weight or stationary weight was noted for only one child below the age of 6 months. Between the ages of 6 and 12 months, a time when healthy infants usually continue to grow rapidly, such periods of weight loss or failure to gain for intervals of 1 to 5 months between weighings were observed in almost 40 per cent of the infants. Dr. Mastri (1959) and Dr. Amara (1957) did not discuss the growth of individual infants, hence we do not know to what extent failure of some infants to gain weight may account for the depressed growth, on the average, which both of these observers reported for infants of this age.

During the second year of life children may be expected to gain weight less steadily, but more than 40 per cent of the children of this age in Bang Chan lost weight or failed to gain over intervals of 1 to 7 months.

After 2 years of age approximately one-half to two-thirds of the children weighed in a given 6-month period lost or failed to gain weight. Of 68 children who were weighed and measured over a period of a year or more, only 16 did not experience such loss or failure to gain between any two weighings. Most of these were in the youngest age group, only 3 were over 3 years old at the end of the study.

Possible reasons for failure to gain. - From the information available specific reasons cannot be given for the loss or failure to gain weight of so many of the young children of Bang Chan. Infection may have played a role, although we saw little evidence of severe infection and it was seldom mentioned. Increased activity as children grow older might affect rate of gain at the toddler age. For safety very young children in Bang Chan were closely tended which meant that their activities were rather restricted. As they became older and learned to

[See p. 37 - Analyst]

clear evidence of a seasonal effect. If weight gain in Thai infants is related to seasons, this could be better defined by weighing groups of children at monthly intervals and determining when or if changes in rate of gain occur.

Although our records were not made for the purpose of correlating food intake with weight gain, and no quantitative information was obtained on the diets of mothers and babies, we attempted to see if any obvious relation existed between the variety of food eaten by the mother or the child and the child's growth. For this purpose, case studies were made of 7 infants whose records from birth onward were fairly complete. The age at last observation was from about 14 to 18 months. Four of these children had gained at each weighing and weighed more at one year of age than the average infant observed by Dr. Mastri (1939). Three were chosen because they had lost weight or failed to gain at some time during the period of observation and weighed less at one year of age than the average infant observed by Dr. Mastri. Infants of both sexes were included in each group. No illnesses or abnormalities were recorded in the clinical histories of any of these babies or their mothers. No evidence was obtained from the qualitative food records as to why some infants gained consistently and at a fairly "normal" rate, whereas others gained relatively slowly and failed to gain or lost weight at times (Smith, 1956).

Quantitative food records might have provided evidence on this point but our observations were inadequate for this purpose. Such quantitative records should include estimations of the amount of mother's milk obtained by the infants, based on the baby's weight before and after nursings, as well as records of supplementary food given. Analysis of the mother's milk, particularly for the content of the water soluble vitamins which are influenced by the mother's diet, should also help to shed light on the cause or causes of the common failure to gain weight among older infants and small children in Bang Chan. No cases of beriberi occurred among the infants we observed, but in two instances siblings had died of infantile beriberi.

Evidence of protein malnutrition has not been commonly recognized in rice eating areas, but one must consider the possibility that these children may be in a state analagous to pre-kwashiorkor. Development of the clinically recognizable protein deficiency disease may be forestalled when the child learned to feed himself and eats more liberally of rice with some fish and egg. Of the 54 children with kwashiorkor observed by Petrasiri and Petrasiri (1955) in Bangkok, many were weaned earlier than was usual in Bang Chan. Most of them, however, had been breast fed, and 4 were still being breast fed when the disease was diagnosed.

BANG CHAN

Summary

12 The general condition of health and sanitation in the village of Bang Chan, Thailand, and the nutritional status of 166 persons in a random sample including 31 village households and of 233 primary school children are described.

141 The mean height for adult men in the random sample was 158.6 cm. (62.4 inches) and for women, was 151.3 cm. (59.6 inches).

Mean weights for adult men and women were 53 kg. (116.6 lb.) and 45.3 kg. (99.7 lb.) respectively. Mean and median weights for various age groups did not differ markedly nor consistently.

145 In general, the Thai children were shorter and weighed less than western children of the same ages. Mean heights and median weights fell below the 10th percentile of Iowa school children whose measurements have been reported by Stuart and Meredith (1946).

The reported age at menarche, for 94 females in Bang Chan, ranged from 13 to 19 years, with a median age of 15.

As judged by the median ages of eruption of specific permanent teeth and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan was approximately the same as that of children in other regions, both western and eastern, for which data are available. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent.

164 Children in the Bang Chan primary school were found to be relatively free from caries. Of 226 school children 7 to 14 years of age, whose teeth were examined by a dentist, 42% were completely free of caries of both deciduous and permanent teeth. Of the total group of children, 68% (76% of 116 boys and 60% of 110 girls) were free of caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the children examined had any filled teeth.

The reason for the relatively low incidence of caries

BANG CHAN

164 among children in Bang Chan is not known. One thing which
[146] residents of Bang Chan appeared to have in common with other populations which have been reported to be relatively caries free, was low intake of sugar, particularly in a form which would be apt to adhere to the teeth.

Adults up to 44 years of age, in the random sample, retained most of their teeth. A few adults in Bang Chan have had missing teeth crowned. More sound than missing teeth were [301] found to be crowned, however, i.e. in this community a crowned tooth appears to have cosmetic value.

759 A variety of serious illnesses were found to occur among
[164] residents of Bang Chan. As a rule, local traditional practitioners were consulted first, but most persons reported to have been seriously ill eventually received treatment by outside practitioners with some training in modern medicine.

[834] The majority of mothers in childbirth were attended by
[743] local traditional midwives, but a few difficult cases were taken to the government Health Center in the nearby town of Minburi, where a trained midwife was in attendance.

165 Of 438 pregnancies reported by 84 mothers, over 90%
[163] resulted in live births. Of the 397 living children born to these women, 81% survived at the time of interview. Within the first month of life, 7% had died, and a total of 11% died within the first year. Tetanus was prominent among causes of death of infants under one month of age. Infantile beriberi caused some deaths among older infants. In a majority of cases, the cause of death of infants could not be clearly identified, but fever, debility and convulsions were the symptoms most commonly described.

196 Almost half of the persons examined for possible signs of nutritional deficiency, 46% of the school children and 47% of the family sample, were free of such signs. The remainder, slightly more than one half of persons examined, had from 1 to 7 signs each. In general, more of the children and adolescents than the adults were free of possible signs of malnutrition, and the larger percentages of persons with 2 or more signs were in the groups of older persons examined. Signs most often noted, namely changes in tongue, lips, skin and hair, and absence of knee and ankle jerk, might reasonably be associated with apparent deficiencies of riboflavin, vitamin A and thiamine [164] in the diet. The only clearly defined deficiency disease observed among residents of Bang Chan during the field study was beriberi.

14 Hemoglobin values of 11.5 g or less per 100 ml. were

BANG CHAN

14 observed in 9% of the school children 7 to 14 years of age who were examined, and in about 6% of the males and 25% of the females over 15 years of age. Of 337 persons examined, however, 2 only, one child and one adult female, were found to have hemoglobin values under 9.75 g per 100 ml.

744 514 164 364 Modern sanitation was practically unknown in Bang Chan. Few families had covered pit latrines or made any effort to cover excreta. Intestinal parasitism was common. Garbage might be fed to animals, but was frequently thrown into the canal or elsewhere about the compound. Provisions for protecting foods from contamination were meager.

When rain water was available, it was used for drinking, but several months each year water from the canals or fish ponds was used without prior treatment. For washing vegetables, cooking and washing dishes, canal and pond water was used throughout the year.

744 751 A few changes in sanitary practices, if they could be brought about, might reduce some kinds of illness substantially. For example, if the villagers would adopt the practice of boiling pond or canal water whenever it is to be used for drinking, contamination from this source would be materially reduced.

Use of boiled water for bathing babies and all persons with abrasions or open wounds would probably reduce the incidence of skin infections, and enable those which do occur to heal more quickly.

Infantile tetanus could be largely if not entirely prevented if the local midwives were taught to use sterile scissors for cutting the cord, and to avoid contact of the cord with soil.

758 121 Modern medicine will probably not be readily or generally available to a majority of the residents of Bang Chan for many years to come. The first step toward better health in a village such as Bang Chan appears to be to teach the people, through their local leaders and practitioners, to adopt improved health practices. To be effective, such teaching must be based not only on a knowledge of what the people do, but on an understanding of the way they think and feel about customary practices.

125 included adults of both sexes and some preschool children who
123 were unwilling to allow the physician to examine them. The small non-response group included persons of both sexes and a wide range of ages, and would therefore not be expected to bias the sample seriously. In general, rapport and cooperation were excellent.

Reproductive Function in Females

[145] Information concerning menstrual history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied (See Appendix A, schedule 3, item 35).

Information on child-bearing history was obtained from women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied (See Appendix A, schedule 3, item 36).

Illness and Injury

12 [164] Evidence concerning the nature and extent of illness and injury in Bang Chan was obtained from various sources:

1) direct observation by the physician at the time of the physical examination, or when the physician was asked to visit a sick person in the village;

2) field notes in which information concerning illnesses, accidents and deaths were recorded as research workers learned of them; and

3) information obtained by structured interview in connection with surveys conducted by various persons working on the Cornell Thailand Project.

Adults in households which were included in the random sample were asked after the clinical examination whether any family member had been ill or injured during the past year. If so, the interviewer asked the nature of the illness or injury and what was done. The portion of schedule 6 which relates to this is included in Appendix A.

Some questions on illness were included in a survey of household heads in Hamlet KY-7 (Hanks, 1954) and in a structured interview to which there were 335 respondents from the

[see pp. 51-52--Analyst]

BANG CHAN

Among the men and boys in the random sample of households, however, mean height and weight was distinctly less for the age group 15-19 (mean age 17) than for the older age groups (Table 4), and mean height and weight increased with age among the subgroups. Thus mean height of 4 boys 18 and 19 years old was 157.6 cm., and mean weight 50.2 kg. as compared to 150.1 cm. and 38.5 kg. for 4 boys aged 15-16. Among the 20 men in age group 20-39, 3 were age 20, and 4 either 23 or 24. Mean heights for both of these subgroups were 157 cms. The number of young men examined in Bang Chan is too small to permit judgment as to when adult stature is attained. On the basis of measurements of Siamese males, from the medical service of the Royal Siamese Navy, Dr. Yong concludes that "growth, as regards both height and weight stops at age 22" (Chutima, 1939). According to Zimmerman (1937) rural Siamese boys increase in height steadily until about 19 years of age, at which time they seem to have reached maturity. Adult men in Bang Chan were on the average a little shorter than other groups of Thai men whose measurements were available to us (Table 7).

Bicristal Diameter. - Some additional information concerning body build is obtained from this measurement. In general, for Bang Chan children of elementary school age (Tables 1 and 2), mean bicristal diameters correspond to hip widths for Iowa school children one to three years younger (Stuart and Meredith, 1946). Mean bicristal diameters of adult men and women in Bang Chan (Tables 4 and 5) correspond approximately to the values for the 10th percentile of the 18 year old boys and girls in the Iowa study. Andrews (1943) found the hip breadth of Central Thai men to be 26.98 ± 1.48 cm., which is similar to the mean of 26.9 cm. for 31 adult males, aged 20-59, in Bang Chan.

Cristal Height. - At the time this study was undertaken, the Committee on Anthropometry of the Food and Nutrition Board, National Research Council had tentatively recommended cristal height as an additional measurement pertaining to the long dimension of the body. Mean values and ranges, for various age groups, are presented in Tables 1, 2, 4 and 5.

Dental Status

A dentist examined the teeth and mouths of 226 school children, 7 to 14 years of age, in good natural light, using mouth mirror and probe. Teeth of persons in the random sample of village households were inspected by the physician in the course of the clinical examination. Data on dentition and dental health were analyzed by Kamalanathan (1956).

As noted by the Joint FAO/WHO Expert Committee on

[TEXT CONTINUED ON PAGE 21]

[see p.: 16; 20; 9-13; 16, 17; 9-13, 16, 17]

BANG CHAN

As noted by the Joint FAO/WHO Expert Committee on Nutrition (1951) the part played by diet in the production of tooth which are unduly susceptible to caries is still controversial, although in general, the importance of nutrition, especially in the formative period, is widely accepted. In accordance with the recommendation of this Committee, caries rates are recorded as a separate item, and are not taken as a criterion of malnutrition.

Dentition. - Median ages of eruption of specific permanent teeth in 240 Bang Chan children, ages 7 to 14, are shown in Table 20 (Appendix B). For this purpose, data on 226 children in the Bang Chan primary school, and 14 additional children between these ages, in the random sample, were included. The percentage of boys and girls at each age, having each specific tooth erupted, was calculated. Median ages of eruption were estimated according to the method suggested by Klein et al. (1937). A graph was drawn for each kind of tooth, for each sex. Cumulated percentages for each specified kind of tooth erupted were represented on the x axis and age in years at one year intervals on the y axis. Median age of eruption was estimated by determining the point at which the age percentage eruption curve cut the 50% perpendicular.

In Bang Chan, as elsewhere, the median age of eruption for specific teeth is lower for girls than for boys. In some cases the difference is slight, in others, from several months to more than a year. The difference is most marked for lower canine teeth.

The average number of teeth, deciduous, permanent and total, at each age, is shown for children 7 to 14 years of age, in Table 21 (Appendix B). For ages 8 to 13, the greater dental maturity of girls than boys is reflected in the larger average number of permanent teeth present at each age.

On the basis of median ages of eruption for specific teeth, and the number of permanent teeth per child at each age level, dental maturity of children in Bang Chan appeared to be approximately the same as for children in other regions, in both eastern and western hemispheres, with which they were compared. Although the average number of teeth at some ages was lower for children in Bang Chan than for American or English children, the differences were neither marked nor consistent (Kamalanathan, 1956).

Caries Incidence. - Caries incidence was found to be low among Bang Chan children as compared to many regions in which surveys have been made. Of 226 children examined by the dentist, 42% (45% of the boys and 38% of the girls) were totally free of caries. When all carious teeth, both deciduous and permanent, were included, the average number of carious teeth per child was 1.8 (1.6 for boys and 2.0 for girls).

BANG CHAN

164 Considering deciduous teeth only, in a group of 173 children, 93 boys and 80 girls who had deciduous teeth, 56% of the boys and 50% of the girls were free from caries. The average number of carious deciduous teeth per child was 1.4 and 1.5 for boys and girls respectively. For those with caries experience, the number of carious deciduous teeth per child was 3.2 for both boys and girls.

In the entire group of 226 children, 76% of 116 boys and 60% of 110 girls were free from caries of permanent teeth. The average number of carious permanent teeth per child was 0.5 for boys and 0.9 for girls. For children with caries experience, the figures were 1.9 and 2.3 for boys and girls respectively. None of the 30 boys with caries of permanent teeth had more than 4 such teeth, whereas 5 of 43 girls had more than 4 carious permanent teeth.

164 171 Data for children aged 12 to 14 in Galesburg, Illinois and Colorado Springs (Dean et al. 1942) have been chosen for comparison of caries experience in permanent teeth, with that in Bang Chan. In these cities, the fluoride content of the water is conducive to low caries incidence, yet the percentage of children aged 12 to 14 having caries experience was 72.2 and 71.5 for Galesburg and Colorado Springs, respectively as compared to 41% for Bang Chan, and the number of DMF[1] permanent teeth per child was 2.36 and 2.46 as compared to 0.88 carious permanent teeth per child in Bang Chan.

The reason for the relatively low incidence of caries among children in Bang Chan cannot be stated with certainty. Similarly low or even lower caries incidence has been reported for certain age groups of children in various parts of the world, for example in North China (Afonsky, 1951), in the northern islands of Samoa where the people had little access to store foods (Losee, 1952) and in a small isolated village in Greece [146] (Phillipas, 1955). One thing which residents of Bang Chan appeared to have in common with such other populations which are relatively caries free, was low intake of sugar[2], particularly in a form which would be apt to adhere to the teeth.

757 Restoration of Decayed and Missing Teeth. - None of the children examined had any filled teeth. Up to 44 years of age, the adults examined had retained almost all of their teeth, and [145] no evidence of restoration, other than crowning was noted. Decline in average number of teeth was marked after age 55.

Of 92 adults with teeth, at least 7 men and 6 women had been to a dentist as evidenced by the presence of crowned teeth

---

1. DMF denotes decayed, missing and filled. Children in Bang Chan had no filled teeth.

2. Sudsaneh (1956) found the average per capita intake of sugar in 11 families to be only 6 grams per day.

BANG CHAN

757 in their mouths. More than half of the teeth crowned were said to have been sound, and no crowned molars were noted. The services of a dentist appear to have been sought more for their cosmetic value than for dental care as such.

276 164 Betel Chewing and Dental Health. - Betel chewing was not habitual with any of the adults under 25 years of age who were examined. Among adults above this age in the random sample, 13 of 29 men, or 45%, and 34 of 40 women, or 85% chewed betel. The group of adults from 25 to 44 years of age was singled out for study of caries incidence in relation to betel chewing, since adults retained most of their teeth up to this age. Among 19 betel chewers, 3 persons had 5 defective teeth whereas among 19 non-betel chewers, 7 persons had 46 defective teeth. Others (Gerry et al. 1952; Shouric, 1948) have reported a lower incidence of caries among betel chewers than non-chewers. Caution must be used in interpreting our observations, however, because the sample is small, and the teeth were not cleaned before counting caries. Stain and calculus may have obscured small caries in betel chewers.

The impression was gained by casual observation that protruding incisors were common among habitual betel chewers, and that the teeth of some betel chewers appeared to be loose. Since such protruding incisors were not noted among the school children, nor among non-chewers, we associated them with habitual betel chewing. Both Gerry et al. (1952) and Balendra (1949) noted a higher incidence of gingivitis among betel chewers than non-chewers. Since most of the older persons in our sample chewed betel, our data offered no clue as to the possible effect of betel chewing on the loosening and loss of teeth among older persons. Another item of possible importance, and on which we have no data, is the extent to which tobacco is used as an ingredient of the mixture which is spread on betel leaves.

276 146 Platt (1945) considered betel chewing as a potential source of calcium in the diet. He stated that the amount and utilization of calcium ingested with 6 betel leaves was similar to that from 10 ounces of cow's milk.[1]

The amount of calcium ingested in this way doubtless varies not only with the frequency of betel chewing, but also with the amount of juice swallowed. In Bang Chan, spitting out the juice appeared to be more customary than swallowing it.

276 Further research is needed to decide whether the potential disadvantages of betel chewing outweigh its potential benefits. Moreover in any attempt to decrease the practice of betel

---

1. Platt, 1945. Footnote, p. 21.

BANG CHAN

Table 9

147 Hemoglobin Values of 104 Residents, Age 15 and Older, in Random Sample, Bang Chan, 1952-53

	Number of Persons	Hemoglobin, grams per 100 ml.					
		Under 9.75	9.75-11.5	11.75-12.5	12.75-13.5	Over 13.5	Not Ascertained
Male	48	0	3	7	9	28	1
Female	56	1	13	10	14	11	7
Total	104	1	16	17	23	39	8

146 125 Occurrence of Possible Signs of Malnutrition. - Most of the signs and symptoms included on the schedule for clinical examination were those known to be of value in the assessment of nutritional status (Joint FAO/WHO Expert Committee on Nutrition, 1951). Some items included need to be investigated more fully before their value can be determined. Among the 146 items on the schedule, (Appendix A) the following were not 164 observed in any of the persons examined:

Eyes: photophobia, lachrymation, blepharitis, xerophthalmia, Bitot's spots, gross corneal vascularization.

Face: Folliculosis, nasolabial seborrhea, dyssebacia, suborbital pigmentation.

Lips: Scars of cheilosis and of angular stomatitis.

Tongue: Edema, color change to scarlet or magenta. (In 30 adults, however, such color changes if present would have been obscured by the discoloration from betel chewing.)

Gums: Retraction, loss of interdental papillae.

Parotid glands: Enlargement.

Skin: Perifollicular congestion, petechiae.

Edema

Calf tenderness

Inability to rise from squatting A1 [see p. S1-Analyst]

BANG CHAN

In addition, the two cases of symmetrical dermatosis observed were not of the pellagroid type and should probably not have been included with the possible signs of nutritional deficiency.

The only instance of thyroid enlargement noted (an obvious thyroid adenoma) was in a 13 year old boy who had always lived in Bang Chan. He knew of no one else in the family with such enlargement.

Five girls and women in the random sample refused to permit the examining physician to palpate the liver and spleen, but he was able to carry out the rest of the inspection.

Almost half of the groups examined, 46% of the school children and 47% of the family sample, were free of the possible signs of nutritional deficiency. The remainder had from 1 to 7 such signs. Persons in the random sample were grouped according to age, and the percentage of each group found to have each number of signs is shown in Table 10. Note that most of the

Table 10

Number of Possible Signs of Nutritional Deficiency Occurring in 166 Individual Residents in the Family Survey, Grouped According to Age

Age Group, years	Number of Persons Examined	Percentage of Each Group Found to Have Each Number of Signs			
		0	1	2	3 or more
6 and under	33	94	3	3	0
7-14	34	47	38	9	6
15-19	17	76	18	6	0
20-39	41	32	54	7	7
40-59	27	7	33	22	37
60 and over	14	21	7	21	50
Total Group	166	47	30	10	13

preschool children were free of signs. In general, more of the children and adolescents than the adults were free of possible signs of malnutrition, and the larger percentages of persons with 2 or more signs were in the groups of older persons examined. Among the children, a larger proportion of school children than preschool children or adolescents had possible signs of malnutrition; i.e., more than half of the children 9-14 years of age, as compared to 6% of the children 6 years old or under, and 24% of the age group 15 to 19 years.

The incidence of specific signs among school children and persons in the random sample of families, is summarized in Table 22 (Appendix B).

Several points concerning the distribution of specific signs possibly associated with nutritional deficiencies deserve comment. The most prominent group of signs among school children were the skin signs: xerosis which occurred in 15% and phrynoderma in 5% of the children. Even loss of elasticity of skin occurred in 3 boys. Among adults, these signs were confined almost wholly to the group of older women.

Liver enlargement was next in frequency among school children, with 9% of them exhibiting this sign. We have no evidence as to the cause of liver enlargement. It is sometimes associated with protein deficiency, but our data on food intake (Sudsanoh, 1956) is on the basis of family consumption, hence we do not know whether school age children have relatively low intakes of total protein or of animal protein. Liver enlargement may also be associated with intestinal parasitism, which was common in Bang Chan.

Dry, "staring" hair was observed in 18 children. One case of diminution of pigment was recorded. A number of other cases in which dark hair had an auburn cast, were noted by the non-Thai nutritionist, but were accepted as normal hair color by the Thai physician.

Ulcers on the legs below the knees were observed in 14 school children. Such ulcers, though not associated with any specific nutritional deficiency, occur commonly in ill-nourished subjects (Smith, 1952).

Some school age children both in the random sample and in Bang Chan primary school, did not have knee and/or ankle jerk. These signs were more prominent among adults, however, particularly among men, than in the school age group.

The occurrence of skin changes among older women, together with the higher incidence of low hemoglobin values among women than among men, accounts for the seemingly higher incidence of possible signs of malnutrition among adult women than men. The only clear difference in occurrence of signs among

[see p. 67 - Analyst]

BANG CHAN

146 164 women of childbearing age as compared to older women, was in the incidence of skin changes. Certain of these, i.e. xerosis, loss of elasticity and atrophic skin, were observed, in the adult group, only among older women. In some cases at least these signs may have been associated with aging rather than nutritional deficiency, unless, indeed some of the common signs of aging prove to be due to long continued intakes which are suboptimal. Among the school children, however, these skin changes were clearly abnormal.

At the clinical examination, redness of the gums was noted in a few cases only among school children, most of whom were examined in November. The dentist, who examined the children in February, noted redness of gums in about one-fourth of them. This difference may reflect a difference in standards used by the physician and dentist, or the incidence of this sign may have increased between examinations.

Certain groups of signs tended to occur together. Thus the various skin signs: phrynoderma, xerosis and loss of elasticity were often associated. Of 23 cases with absence of knee jerk, 16 had absence of ankle jerk also, and the various changes in tongue and lips not only tended to occur together, but these were often associated with absence of knee jerk and/or ankle jerk. The signs of possible nutritive deficiency most commonly noted, namely changes in tongue, lips, skin and hair, and absence of knee and ankle jerk, might reasonably be associated with apparent deficiencies of riboflavin, vitamin A and thiamine in the diet (Sudsaneh, 1956).

146 142 Bowleggedness was observed in a larger proportion of adults than children, but according to our criteria, did not occur in either group to the extent that we had been led to expect from previous reports. Among the 198 school children in Bang Chan who were examined by a physician in 1948-49, 69, i.e., about 35%, were reported to have bowed legs, with 4 cases called "severe" (Sharp et al. 1953, p. 249). Among the 233 children in Bang Chan school whom we examined, 9 only, i.e., less than 4%, were considered bowlegged according to our criteria, and none of these cases was severe. Chutima (1939) stated that "Another condition prevalent in Siam and fundamentally due to improper diets since infancy is bow-leggedness. Only about 25% have normal lower limbs, the rest being bowlegged and many are knock-kneed . . . The percentage of extreme bow legs is about 20% while mild bow legs form about 55% of our school children." Since these other observers determined bowleggedness by casual inspection[1], some of the difference between the earlier observations and ours may be due to difference in criteria used. The children

1. Personal communication from Dr. Yong Chutima.

146 pictured as bowlegged in Chutima's report (1939) are, however,
142 clearly so, and represent more extreme cases than we encountered among the children in Bang Chan in 1952-53. If the incidence of bowleggedness among children in Thailand is indeed decreasing, an investigation into possible causes of the change would be of interest.

142 To the nutrition specialist on the team, who was not Thai, the knee joints appeared to be large. Moreover, although the term "knock knees" was not included on the schedule, it was entered frequently by the physician under comments (Appendix B, Table 22). Whether this condition is related to heredity,
[516] nutritional status, or to some other environmental influence such as the life-time habit of squatting on the heels, is not known.

146 The physician's estimate of general appearance and vitality were recorded early in the examination, before he sought for specific signs. About 80% of all persons examined were rated as "good," and less than 1% as "poor." About half of all persons rated as "good" in general appearance and vitality were without clinical signs, as compared to about 30% of those rated "fair." Of persons with 3 or more possible signs of malnutrition, however, about 2/3 were rated "good" (Appendix B, Tables 23 and 24). As has been observed frequently, such a general appraisal is not correlated with the presence or absence of clinical signs possibly associated with malnutrition. Clearly, in Bang Chan, there is little or no malnutrition of the sort that causes marked apathy.

In summary, a variety of possible signs of malnutrition were noted both in the school children and the persons in the random sample of village households. More than half of the total number examined had one or more signs possibly due to malnutrition, but the only clearly defined deficiency disease encountered was one case of beri beri[1] in a 49-year old man.

Reproductive Function in Females

84 Menstrual History. - Information concerning menstrual
125 history was obtained from girls and women in the random sample of village households, and from mothers of the infants and small children whose growth and food patterns were studied.

145 Most of the women from whom information on age at menarche was obtained were under 40 years of age. A few could

---

1. History of beriberi among nursing mothers and their
[149] infants was obtained in several instances, and cases of beriberi, in both sexes, were seen among persons not included in the population samples which were examined.

A [see p. 71-Am.] B [see pp. 72, 73-Analysis]

844 mats on the floor as most of them would have done at home.
[743] Relatives were welcome; indeed they were supposed to come and help.

• 164 12 Nature and Incidence of Illness and Injury, and Treatments Sought by Residents of Bang Ch[illegible] - Evidence concerning the nature of illness and injury in Bang Chan was obtained in connection with the clinical examination of school children and persons in the random sample of village households; from questions in two types of structured interviews with household heads: 1) in the entire village, and 2) in one hamlet, KY-7; and from the field notes of workers associated with the Cornell Thailand Project.

164 In connection with the clinical examination, information was obtained from heads of 30 of the 31 households whose members were examined (See schedule in Appendix A).[illegible] In this group, none reported any accident or injury, and 26 said that no member had been ill within the year. Illness was reported as occurring in 4 households only. In one of these, a 49-year old man reported loss of sensation over the extremities and other symptoms which led the physician in the research group to conclude that he had beriberi. As treatment, this man had used an herb recommended by a priest, a native medicine given him by a neighbor and had gone to a private clinic at Minburi where he received an injection.[1] In another family, a 39-year old man who had asthma, took an advertised remedy which he purchased from a drugstore. Two children in the third family had fever for 8 days, for which a traditional practitioner prescribed herbs. In the fourth family, a 1-year old child with eczema was taken first to a traditional practitioner, then to a private clinic in Minburi where he was given an injection.

164 128 On the basis of other observations, however, we believe that illness and injury are more common in Bang Chan than is suggested by the replies to this particular inquiry. For example, no mention was made in one of the households surveyed of a baby who had been too ill to be weighed and measured, when team members called, and who recovered in a day or two without outside help. Coming as they did at the end of the clinical examination which was new to most of these people, perhaps the questions asked seemed relatively unimportant. No attempt was made to probe beyond the person's reply to the questions as stated.

164 Replies to questions in connection with an intensive

---

1. From casual observation, one is led to believe that the villagers have considerable confidence in "injections," although the nature of the injection received or desired, is not usually specified.

A [see p.51 - Analyst]

BANG CHAN

164 survey made in one hamlet, KY-7, give a rather different picture of the extent of illness and injury in Bang Chan, if the situation in this hamlet is at all representative of the whole. Hanks (1954), found that serious illness had occurred within the previous year in 17 of 38 households[1] in the hamlet KY-7. Twenty-four persons of various ages were involved, and the illnesses were described as lasting from a few days to 3 years. Specific diseases were mentioned in 7 cases: diphtheria, typhoid fever, pneumonia (2 cases), malaria and beriberi (2 cases). In the majority of instances, however, symptoms rather than diseases were mentioned, i.e. fever, diarrhea, pain in chest, disorder of throat, lung complaint, swollen feet, and the like. One case, described as a wound in a 5-year old child, might have been due to accident.

757 In all, the 24 ill persons obtained a total of 40 "treatments,"[2] from one to four types of treatment per patient. Treatment by modern doctors was used more frequently than other means of help (Table 15) although such treatment is not available within the community of Bang Chan. Fifteen of the 24 persons who were seriously ill had treatment by modern doctors, several patients receiving treatment from more than one. Thirteen patients had one type of treatment only (as that from either traditional practitioner or modern doctor), 7 used 2 types, 3 used 3 types, and 1 had 4 types of treatment from 5 individuals. The latter case was that of a child who was described as sick for 60 days with pneumonia, neck swelling and fever, and was treated by a traditional practitioner, two priests who were also traditional practitioners, and a medium, all in Bang Chan, and a second-class doctor in Minburi. Another child who was sick with lom sandan (faintness, weakness or loss of consciousness) for three days was treated by 4 local traditional practitioners and a second-class doctor at Minburi. One child with saang (a disease of young children, said to be caused by the loss of the soul or spirit) was treated by the modern doctor at Minburi, only.

757 As a rule, local practitioners of one sort or another
759 were visited or called first, those in Minburi next, and those in Bangkok, only after nearby help had been consulted. This order was not invariable however. For example, in the Hamlet KY-7 series (Hanks, 1954) was one woman who was sick with beriberi for about 8 months after childbirth. She went first

---

1. Interviews were not obtained with 3 of 41 household heads in the hamlet.

2. Each type of practitioner, as traditional practitioner or modern doctor, was counted as a separate "treatment."

[TEXT CONTINUED ON PAGE 37]

A [See p.36-Analyst].

BANG CHAN

757 to a second-class doctor in Minburi, then to a nearby Muslim
759 masseuse, then to a local traditional practitioner who gave her some jaa tom (cooked medicine). Another instance, recorded in the field notes, is that of a school teacher's baby who had abscesses on her head. The mother took her child first to Minburi, where she was given an injection and a sulfa drug to be taken orally. The child did not get well immediately, and before all of the drug had been taken, the mother took the child to a local traditional practitioner who gave her a decoction of herbs which was to be given by mouth. Thus in some cases, modern doctors were consulted first, and local traditional practitioners later, if relief was not as speedy as was expected. The experience in this one hamlet suggested a willingness to try a variety of treatments, and the existence of a considerable degree of confidence in modern medicine.

758 According to Ralis (1955), 213 of 335 household repre-
743 sentatives interviewed had visited a clinic or hospital. Of these, 156 had gone to Minburi, and 135 to hospitals or clinics in Bangkok, some having gone to both places. Of 258 hospital or clinic visits, 125 were for treatment or hospitalization; the bulk of the rest were to accompany patients or to visit hospitalised relatives or friends. No significant difference in reports about seeking treatment or hospitalization was found between groups of persons differing in literacy, or in socio-economic level.

• 164 Infectious disease. - The principal evidences of infectious disease noted in the course of the clinical examination for assessment of nutritional status were trachoma and smallpox scars. Occasional cases of ringworm and other fungus infection, and of pediculosis were observed by the physician.

When the 233 school children and 148 additional persons included in the random sample of village households are considered together, i.e. a total of 381 persons or more than one-fifth of the total population of the village, only 3% were found to have trachoma. Eleven of 13 cases found were among 237 children 7 to 14 years of age, i.e. an incidence for this group of 4.6%. Zimmerman (1931) reported 119 cases or 4.3% of all persons examined in Central Thailand, and 277 cases or 2.9% of persons examined in the whole Kingdom. Among the school children examined, however, he reported an incidence of 12.6%.

Of 381 persons examined in Bang Chan, only 10, or fewer than 3% had smallpox scars. Two cases only were in adults, the remaining 8 being among children of school age. Our records do not show when the most recent cases occurred in the village.
751 According to Zimmerman (1931), 88% of over 2200 school children examined had been vaccinated. No information was obtained concerning the proportion of residents of Bang Chan who had been

BANG CHAN

751 vaccinated but among school children the percentage is very high. During the survey period a health officer came to the Bang Chan elementary school to vaccinate children; and at that time at least one nearby resident, a school teacher's wife, brought her infant for vaccination.

• 164 Illnesses probably, in most cases certainly, of infectious origin, which were mentioned in the field notes, include the following, which are listed roughly in the order of frequency: skin disorders such as abscesses and boils, fever, respiratory disorders including colds and influenza, tuberculosis, "upset stomach," measles and diphtheria. Two cases of diphtheria with one death, occurred while the survey was in [744] progress. At this time health authorities came to the village to inoculate the children on a voluntary basis (Hanks et al. 1955). As already noted, malaria and typhoid (one case each), were mentioned as occurring during the year previous to the inquiry in Hamlet KY-7 (Hanks, 1954).

[759] [743] A number of references were made to history of cholera, smallpox and malaria, but these did not appear to be current threats. Two cases of severe diarrhea were called "cholera" but one was on the way to recovery the next day. The traditional practitioner who was asked to treat the other, urged that she be taken to the hospital, and himself accompanied the patient and family members. At the hospital, they were told that members of the family and neighbors should "get vaccinated and have their toilet covered."[1] No further mention of this case is made in the field notes, hence the correct diagnosis is not known to us.

Since a modern doctor was frequently not seen, diagnosis of disease was often uncertain. More often, major symptoms were described or the disorder was given a local name, for which there is no good English equivalent, such as various kinds of *saang* and *lom*.

Non-contagious disorders. - Among current non-contagious disorders mentioned in the field notes, in replies to questions on surveys, and in some cases observed by the physician, were the following, listed roughly in order of frequency: menstrual disorders, headaches, beriberi, cancer, asthma, eczema, nephritis, and rheumatism.

Accidents. - Accidents which were recorded in field notes include bites of dogs, spiders, leeches and snakes, falls from buffaloes and down ladders, burns, cuts, drowning and poison from drinking kerosene. Among the school children examined,

---

1. Field notes, S.S., April 29, 1954.

BANG CHAN

164 malunion of old fractures was observed in two cases.

165 Deaths. - Information concerning deaths in Bang Chan during the period of the field study was obtained primarily 12 from field notes. Mothers interviewed or examined by members of the research group which was specifically concerned with health and diet provided further information on infant mortality, and Ralis (1955) obtained some information concerning deaths of children in the respondent's family.

165 Deaths occurring while the field study was in progress. - During approximately 21 months of field study, members of the research group noted 14 deaths in the village. Three infants died, two within a few days of birth, and one at about two months of age. Two children died by accident, one as the result of a fall from a water buffalo, and the other by drowning. One child died of diphtheria and one of Hodgkin's disease. Of the seven adults who died during this period, one was a pregnant woman who became acutely ill and died while enroute to the Health Center at Minburi by boat. The cause of her illness was not known. One young man committed suicide, two adults died of tuberculosis, two of cancer, and one of colitis. One of those who died of tuberculosis was a young woman, the mother of seven children. She was urged by the physician on the team to go to the hospital in Bangkok, but she was unwilling. A sibling 8 years old, who lived in the same household, had died previously with a severe cough.

Mortality among infants and children. - Of the 397 living children born to 84 women interviewed, 323 or 81% of the children survived at the time of interview. Forty-three, or 11% had died within the first year, and 26 or 7% within the first month of life.

Although the data obtained by Ralis (1955) did not permit us to calculate the exact number of children born to the 335 household members interviewed, the number dead, and the number surviving at the time of interview, apparently more than twenty per cent of the children born into these families died (Appendix A). This estimate, for the village as a whole, tends to substantiate the figures obtained from the 84 mothers whom we interviewed.

Some information was obtained from 36 mothers concerning the cause of death of 58 children who were born alive. Twenty-one of these had lost one child only, 8 had lost 2 each, and 7 had lost 3 children each. Reported causes of death are summarized by ages, in Table 16.

In most cases, no specific cause could be assigned, and the case was classified according to the most prominent symptom as fever, convulsions or digestive disturbance.

A [see p. 51 - Analyst] B [see p. 40 - Analyst]

BANG CHAN

Deaths of infants a few days old, with a description of lockjaw, inability to suck, stiff back and clenched hands, were recognized as due to tetanus. The common practice of native midwives is to place the cord over a hard rhizome or clod of earth and to cut it with a tapered piece of bamboo. Thus, infection with the tetanus organism may occur from contact with the soil. Foto that 12 of 26 deaths reported for infants under 1 month, were diagnosed as tetanus or probably tetanus. Zimmerman (1931) summarized important causes of death in Siam, based on the physician's diagnosis made after symptoms were described by the head of the household. Of 1800 deaths which occurred in the 18 months preceding the survey, 2% were diagnosed as tetanus. For the Central area, 3.8% of 495 deaths were from tetanus. Most, if not all of the cases of infantile tetanus could be prevented if native midwives learned to avoid contact of the cord with earth or a soil-coated rhizome. By using sterile scissors for cutting the cord instead of tapered bamboo which must be pressed against another surface to accomplish the cutting, contact with soil could be avoided. Of 335 household heads interviewed, 220 owned scissors of some kind (Ralis, 1955).

Infants several months old, who had some of the symptoms of infantile beriberi, as convulsions and almost voiceless crying, were considered as cases of infantile beriberi only if the mother had symptoms of beriberi, such as numbness or tingling in the extremities, or difficulty in walking, at the time. One mother had lost 3 infants at 3 or 4 months of age, with similar symptoms, but described the symptoms of beriberi in herself at the time of the death of the last baby only. The other two cases were therefore listed as convulsions, cause unknown. The occurrence of infantile beriberi reflects the unsatisfactory nutriture of the mother, whose milk is therefore low in thiamine content. To prevent deaths from infantile beriberi, the general level of nutrition in the village, and particularly the food habits of pregnant and nursing women, should be improved.

Note also the number of deaths from "debility." As the Joint FAO/WHO Expert Committee on Nutrition (1951) has pointed out, the number of early deaths from "congenital debility" becomes insignificant where the health and nutritional status of pregnant women approaches the optimal.

Intestinal Parasitism and Bowel Habits

Intestinal Parasitism. - All school children were provided with tin containers labelled with their names, and asked to bring a stool sample to school. Fourth grade children whose first stool samples were negative, were asked to bring a second specimen. Parasites were found in some of these second

BANG CHAN

125 specimens. In all, specimens were obtained from 189 or 81% of
126 the children and of these 32% were negative. In 128 stools
containing parasites, 196 infecting organisms were found, or an
• 164 average of 1.5 per infected child. Protozoa and helminths which
are pathogenic or which may cause severe diarrhea were identified 126 times, and harmless forms 70 times. Of the harmful forms, Ascaris lumbricoides was found in 96 or 51% of the stool samples, Giardia lamblia in 19, or 10%, and hookworm, Endamoeba histolytica, Trichuris trichiura and Diphyllobothrium in 2% or less. Of the harmless forms noted, Endamoeba coli was found in 45 specimens or 24%, Iodamoeba williamsi in 21 or 11%, Endolimax nana and Chilomastix mesnili each in less than 2%. Doubtless the extent of intestinal parasitism in these school children was greater than the figures indicate, since some cases would be missed in examination of single stool specimens collected in this way. One might expect intestinal parasitism to be relatively common, also, among other family members.

125 Bowel Habits. - In connection with the clinical survey,
147 persons examined were asked whether they had "constipation" or
514 "diarrhea" frequently, occasionally, or never, i.e. not within the past 6 months. As the physician phrased the questions concerning "constipation," the replies indicated whether the respondent had daily bowel movements ("never constipated"), or usually had a bowel movement each day ("occasionally constipated") or usually had longer intervals between bowel movements ("frequently constipated"). Replies are summarized in Table 17. A

126 Considering the inadequate sanitation in Bang Chan, and
147 the prevalence of intestional parasitism, the fact that 3/4 of the persons questioned said they "never" had diarrhea, is worthy of note. Most persons who reported having diarrhea
[146] were troubled occasionally rather than frequently. The fact that nearly 2/5 of those questioned had bowel movements less often than once a day, is not surprising in view of the fact that diets which are relatively low in fibrous foods and in the B complex vitamins frequently result in sluggish behavior of the large intestine. That approximately 3/5 of the respondents in Bang Chan usually had a daily bowel movement is perhaps more noteworthy. Even in areas where diets tend to be much more liberal, some persons usually have bowel movements at intervals of 2 or 3 days or even longer. If such persons have stools of normal character and experience no discomfort, this bowel habit may be considered normal for them.

A [see p. 43 – Analyst]

32. Last night, when you ate at your own house, did you eat with your hands, with fork and spoon, or with spoon alone? 125

9.	Hands	242
X.	Fork and Spoon	11
Y.	Spoon alone	73
O.	Unascertainable	7

[264]

33.a. Have you ever been to a clinic or a hospital? [743]

1.	Yes	214
2.	No	119

b. IF YES: In what various places?

3.	Minburi	156
4.	Bangkok	135
5.	Other place	7
6.	Unascertainable what place.	

c. IF H HAS BEEN TO CLINIC OR HOSPITAL: For what various purposes did you go?

7.	Treatment or hospitalisation	123
8.	To bring a patient there	77
9.	Visit relatives or friends	45
X.	Other reason, specify_____	11
O.	Unascertainable	—

34.a. During the last year, did it occur to you frequently, sometimes, or never that you had difficulties falling asleep? [513]

1.	Frequently	73
2.	Occasionally	151
3.	Never	109

b. During the last year, did it occur to you frequently, sometimes, or never that you had a headache? [164]

4.	Frequently	50
5.	Occasionally	174
6.	Never	109

c. During the last year, did it occur to you frequently, sometimes, seldom or never that you lost your appetite?

7.	Frequently	50
8.	Occasionally	173
9.	Never	110

d. During the last year, did it occur to you frequently, sometimes, or never that your hands trembled so as to bother you? [164]

X.	Frequently	17
Y.	Occasionally	93
O.	Never	218
—	No Answer	5

e. During the last year, did it occur to you frequently, sometimes, or never that your heart beat so fast as to bother you?

1.	Frequently	36
2.	Occasionally	154
3.	Never	141
—	No Answer	2